

**UNITED STATES DISTRICT COURT
FOR THE WESTERN DISTRICT OF TEXAS
WACO DIVISION**

GREENTHREAD, LLC,

Plaintiff,

v.

INTEL CORPORATION, DELL INC., AND DELL
TECHNOLOGIES INC.

Defendants.

Case No. 6:22-cv-105-ADA

JURY TRIAL DEMANDED

**DELL'S REPLY IN SUPPORT OF ITS MOTION TO
DISMISS GREENTHREAD'S FIRST AMENDED COMPLAINT
FOR FAILURE TO STATE A CLAIM FOR RELIEF**

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Note: All emphasis in this brief is added unless otherwise noted.

Greenthread's response to Dell's Motion fails to address the deficiencies that Dell identified in the First Amended Complaint ("FAC"). Dell is not seeking to prematurely construe the patent claims, nor is it asking the Court to "interpret" what little data Greenthread did provide with its Complaint. Rather, Dell merely seeks to hold Greenthread to its obligation to set forth a "short and plain statement" of the factual basis for its infringement allegations, to prevent "unlock[ing] the doors of discovery for a plaintiff armed with nothing more than conclusions." *Ashcroft v. Iqbal*, 556 U.S. 662, 678–79 (2009). Critically, Greenthread's FAC fails to assert *any* factual allegations for certain material claim limitations—which Greenthread concedes by expressly stating that discovery is required. *See, e.g.*, Dkt. 38-9, Ex. A-3 at 19; Dkt. 38-10, Ex. B-3 at 16; Dkt. 38-11, Ex. C-3 at 17. No "interpretation" of Greenthread's materials is necessary to confirm this failure, and no expert opinion or claim construction is needed to resolve this Motion.

Greenthread also ignores additional pleading deficiencies specific to the Dell-Sony Accused Products. Specifically, Greenthread does not dispute that the FAC: (1) does not *identify any "well region"* in the accused image sensors, and (2) does not identify *any "active region" containing a "graded dopant concentration."* Greenthread's failure to identify these key claim elements—despite the fact that it does so for other accused products—appears to be deliberate. For example, Greenthread is silent on the location and properties of the accused "well region" because it states it has *no "[i]nformation about well regions"* for the Dell-Sony Accused Products, and no basis to allege these terms are infringed. For the claimed "active region," Greenthread does not appear to dispute that the allegations it pled do not state a claim for relief. Instead, Greenthread relies on *new allegations in its response brief* that for the first time propose the existence of both "vertical" and "lateral" doping gradients in a new region of the image sensor. However, those new allegations are inconsistent with and contradicted by its other allegations, as shown further below.

Thus, Greenthread's attempt to remedy its pleading failures by resorting to new infringement theories in its response only underscores its failures: The FAC provides no facts supporting the allegation that any graded dopant concentrations "aid carrier movement" as required by each asserted patent claim. The FAC should be dismissed with prejudice.

I. Greenthread's FAC Does Not Plead Facts Sufficient to Infer that Dell's Products Use Graded Dopants or Electric Drift Fields To Aid Carrier Movement

As Dell explained in its opening brief, Greenthread's FAC fails to plead facts sufficient for the Court to infer that the accused products meet the requirement found in the asserted claims of the '195 and '502 patents and claim 44 of the '222 patent of "a single drift layer" and a "well region disposed in [the] single drift layer," where both the drift layer and the well region have (1) a "graded concentration of dopants" *and* (2) a "static unidirectional electric drift field to aid the movement of minority carriers" in defined ways. *See* Dkt. 38-1 at 4:18–29; Dkt. 38-2 at 4:57–67; Dkt 38-6 at 8:21–39. At best, Greenthread's Amended Complaint alleges that the accused products satisfy the first requirement (a "graded concentration of dopants"), but not the second. *See* Dkt. 59, Dell's Opening Brief (hereinafter, "Br.") at 9-12.

As Greenthread's prior statements to the USPTO make clear, not every "graded dopant concentration" creates a "static unidirectional electric drift field to aid the movement of minority carriers" as required by the asserted claims. *See id.* at 12 (citing Dkt. 51-4 at 68). Importantly, the "electric drift field" requirement represents the purported invention's supposed point of novelty and was necessary to obtain the patents' allowance. *See id.* at 10 n.5 (citing Dkt. 51-3 at 2-3; Dkt. 51-4 at 40; Dkt. 38 ¶ 1). This requirement therefore is "material" to the claim and demands a more detailed pleading. *See Vervain, LLC v. Micron Techs., Inc.*, No. 6:21-CV-00487-ADA, 2022 WL 23469, at *5 (W.D. Tex. Jan. 3, 2022). Yet not only does the FAC not provide sufficiently detailed allegations for this key limitation—it fails to provide *any* factual allegations directed to it at all.

See Br. at 10. Indeed, the FAC acknowledges that Greenthread lacks any supporting facts to allege this limitation is infringed, asserting only that “[d]etails regarding electric field characteristics are in the possession of Defendants and are expected to be obtained through discovery.” E.g., Dkt. 38-9, Ex. A-3 at 19; Dkt. 38-10, Ex. B-3 at 16; Dkt. 38-11, Ex. C-3 at 16.

Rather than address this deficiency, Greenthread tries to sidestep the issue by asserting Dell’s motion is “procedurally infirm” for seeking to “interpret” the claims and the data Greenthread cites. Dkt. 69 (“Opp.”) at 11. Greenthread also contends the FAC “provides direct evidence” regarding the electric field limitation. *Id.* Greenthread is wrong on both counts.

First, Greenthread incorrectly asserts that “Dell actually disputes ... Greenthread’s interpretation of the data in its Amended Complaint.” *Id.* (emphasis in original). As explained below, the FAC does not provide **any** “data” regarding the relevant limitations, much less any “interpretation” of that missing data for Dell to dispute. Nor does “resolving the dispute Dell raises ... require the Court to construe the claim terms.” *Id.* at 12. Given the complete absence of any factual allegation directed to the “electric drift field to aid the movement of minority carriers” limitation, the Amended Complaint fails to state a claim for infringement under **any** construction.

Second, Greenthread fixates on its inclusion of SRP data in its Amended Complaint, which it newly alleges “‘provides an *electrical* depth profile’ and ‘gives intrinsically *electrical* information.’” *Id.* at 13 (emphasis in original). Apparently hoping the Court will infer “electric field” from the word “electrical,” Greenthread argues that the Amended Complaint provides “*direct* evidence of the electric fields and carrier movement through SRP” test data. *Id.* (emphasis in original). But Greenthread’s own newly cited documents and the FAC itself belie this argument, and instead confirm that SRP is merely another test of dopant concentration.

Greenthread now cites two publications discussing SRP as exhibits to its opposition.

Neither of these publications is referenced in the FAC and, for that reason, cannot be used to supplement the Complaint's allegations. *See U.S. ex rel. Sullivan v. Atrium Med. Corp.*, No. 13-CA-244-OLG, 2015 WL 13799759, at *6 (W.D. Tex. June 15, 2015). In any event, neither publication supports Greenthread's allegation that SRP evinces electric fields or carrier movement. As explained in these publications, "SRP is basically a comparative technique for the determination of the in-depth resistivity (*and active dopant*) profile of an unknown silicon structure." Opp., Ex. 1 at 123. SRP uses an electrical characteristic ("resistivity") to determine the "active dopant" concentration as a function of depth (a "profile"). *Id.* As a result, "[t]he spreading resistance technique is a powerful method for determining dopant distributions." Opp., Ex. 2 at 1; *see also* Opp., Ex. 1 at 123, 202. Greenthread cites nothing in either publication suggesting SRP reveals information regarding "electric fields" or "carrier movement."

Further, although Greenthread now asserts SRP to be "*direct* evidence of the electric fields and carrier movement" (Opp. at 13 (emphasis in original)), Greenthread never suggests what its SRP data allegedly reveals concerning electric fields or carrier movement. As discussed in Dell's opening brief, Greenthread told the USPTO that a graded dopant concentration alone (as shown in a prior art reference in an IPR) was insufficient to establish the "electric drift field" limitation "*without some additional basis in fact or technical reasoning.*" Br. at 12 (citing Dkt. 51-4 at 68). Greenthread attempts to minimize the import of its prior position by arguing that "the proffered prior art was 'nothing more than a rough drawing' of a dopant gradient, without 'units or numbers' or 'actual data,'" and that it would be incorrect to "jump from the barebones graph to an electric field that would aid carrier movement." Opp. at 15. *This only confirms Dell's point:* by acknowledging that "units," "numbers," and "actual data" are required, Greenthread concedes that electric fields and carrier movement cannot be inferred from a graded dopant concentration alone.

Something more is required, but Greenthread does not provide it. Instead, Greenthread asserts that by virtue of its SRP data, Greenthread “has included in its Amended Complaint everything that the IPR reference lacked, including ‘units,’ ‘numbers,’ and ‘actual data’ regarding the dopant concentration.” *Id.* Greenthread conspicuously fails to provide—either in the Amended Complaint or its opposition—any “additional basis in fact or technical reasoning” that discusses these “units,” “numbers,” or “actual data,” let alone how they would provide a basis to infer an “electric drift field” or movement of carriers. Instead, Greenthread does the very thing that Greenthread says cannot be done: it “jumps from” the graded dopant concentration in the SRP graph to its conclusion that the limitation is met. *See id.* The FAC similarly “jumps from” the SRP images—which show only dopant concentration—to conclude that “[u]pon information and belief, the drift layer has a first static unidirectional field to aid the movement of carriers.” *E.g.*, Dkt. 38-10, Ex. B-3 at 16; *id.* at 17 (same for the second field); *see also* Dkt. 38-11, Ex. C-3 at 16-17; Dkt. 38-9, Ex. A-3 at 3, 17. These allegations directed solely to the “graded dopant concentration” in Dell’s products fail to state a claim regarding the “electric drift field” limitation.

Greenthread further seeks to sidestep this deficiency by arguing that “any issues regarding consistency with the IPR should be evaluated later in this litigation, with the benefit of expert testimony and potential claim construction briefing,” not now. Opp. at 15 (citing *Nalco Co. v. Chem-Mod, LLC*, 883 F.3d 1337, 1346 (Fed. Cir. 2018); *Cima Labs, Inc. v. Actavis Group HF*, No. 07–893, 2007 WL 1672229, at *4 (D.N.J. June 7, 2007)). The *Nalco* case does not support Greenthread, as the issue there “boil[ed] down to [defendant’s] objections to [plaintiff’s] proposed claim construction . . . , a dispute not suitable for resolution on a motion to dismiss.” *Nalco*, 883 F.3d at 1349. Here, no construction is required: there are not **any** allegations whatsoever directed to a material limitation. In addition, Dell respectfully submits that this Court should not follow

the *Cima* decision (which disregarded a patent’s prosecution history) and instead should follow its own decision from *Grecia Estate Holdings LLC v. Meta Platforms, Inc.*, 6:21-CV-00677-ADA, 2022 WL 2019296, at *7 (W.D. Tex. June 6, 2022), where it noted that it may take judicial notice of such statements. While Greenthread incorrectly asserts that Dell claims estoppel applies to Greenthread based on its IPR statements (Opp. at 14), Dell only relies on those IPR statements to highlight Greenthread’s pleading deficiencies regarding this material limitation.

Although the above deficiencies provide a sufficient basis for this Court to dismiss the FAC, Greenthread also failed to plead facts sufficient for the Court to infer that the graded dopant concentration “aid[s] the movement of *minority* carriers.” After Dell pointed out that the FAC does not address this requirement (*see* Br. at 12), Greenthread responded not by identifying relevant allegations from the Complaint, but by stating: “As Dell knows, negatively charged bodies are repelled by negatively charged bodies and attracted to positively charged bodies and vice versa.” Opp. at 16. While this statement is generally true, it does not explain how the claim requirement is satisfied. Greenthread similarly offers the conclusory assertion that “showing an electric field also shows how the movement of a given carrier will be affected by it.” *Id.* Even if this proposition were true, it does not appear in the FAC, and it does not explain *how* carrier movement is affected—it therefore does not support any inference that the movement of minority carriers is aided in the direction claimed. Greenthread’s infringement claims regarding the ’195 and ’502 patents should further be dismissed with prejudice for failing to raise an inference of “aid[ing] the movement of *minority* carriers from said surface layer to said substrate.”

Greenthread’s allegations regarding the ’842, ’481, ’222, and ’014 patents are deficient for similar reasons. Although these patents’ asserted claims do not require the “graded dopant concentration” to generate an “electric drift field,” or recite “*minority* carriers,” they do require a

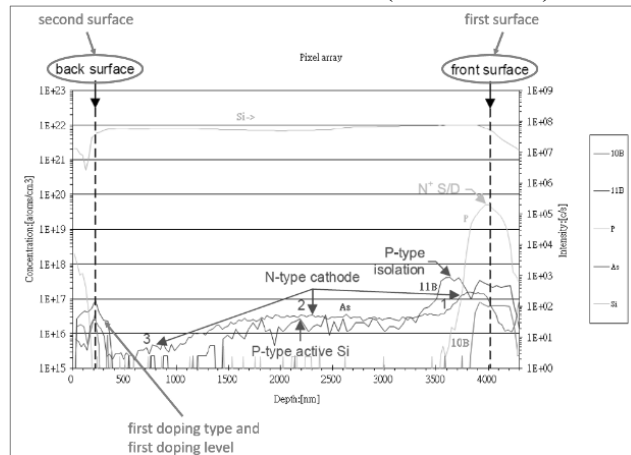
specific graded dopant concentration “to aid carrier movement” between defined structures and regions in specific claimed directions, such as from “the first surface to the second surface of the substrate” or from “the first and second active regions towards an area of the substrate where there are no active regions.” See Dkt. 38-3 at 4:57–60; Dkt. 38-4 at 4:62–65; Dkt. 38-5 at 4:51–55. Although the FAC cites SRP for these limitations, it expressly does so *only* to show the “graded dopant concentration.” See, e.g., Dkt. 38-9, Ex. A-1 at 18-19; Dkt. 38-10, Ex. B-1 at 9-10; Dkt. 38-11, Ex. C-1 at 11-12. Greenthread again pleads only conclusions, not facts that would allow the Court to infer this limitation is met. Its allegations should be dismissed with prejudice.

II. Greenthread Does Not Address its Pleading Deficiencies for the Dell-Sony Products

Greenthread admits that its allegations are “different” for the Dell-Sony Accused Products, which are image sensors. Opp. at 7. For example—unlike for other accused products—Greenthread does not dispute that it *pleads no facts at all identifying the claimed “well regions.”* Br. at 19-20 (quoting Dkt. 38-12, Ex. D-2 at 2, Ex. D-3 at 2). Greenthread also does not dispute that it has no factual basis for alleging infringement of these terms, because “[i]nformation about well regions and doping in such regions . . . is expected to be obtained through discovery.” *Id.* Instead, Greenthread newly contends that nakedly asserting “the accused Dell products include a well region” is sufficient under *Twombly/Iqbal*. Opp. at 17-18. That is incorrect. The location and properties of the “well region” were critical factors relied on by the examiner during prosecution to distinguish the prior art. See, e.g., Ex. 1 (8/11/2021 Notice of Allowance) at 1, 3 (“Claims 1-20 are allowed because the prior art of record does not teach or suggest . . . ‘at least one well region adjacent to the first or second active region containing at least one graded dopant region’”). By “nakedly alleging that the accused product practices the claimed invention’s point of novelty,” the FAC fails to state a claim for relief. *Vervain*, 2022 WL 23469, at *5.

Similarly—unlike for every other accused product—Greenthread *does not identify any*

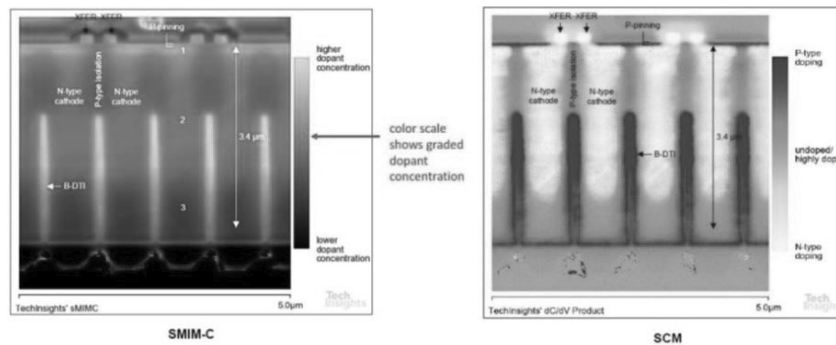
purported “active region” of the Dell-Sony Accused Products that contains a “graded dopant concentration.” The FAC identifies the claimed first and second “active regions” as located in adjacent pixels comprising the image sensor. Dkt. 38-12, Ex. D-1 at 7-10. In order to show a “graded dopant concentration to aid carrier movement from the front surface (first surface) to the back surface (second surface)” of the pixel (right-to-left), the FAC points only to a “downward sloped portion” of the “blue plot” and “dark purple plot” in the “SIMS” graph shown right. *Id.* at 11-12. However, Greenthread admits, as it must, that the



“downward sloped portion” of the SIMS graph on the left between the purple labels “2” and “3” does not constitute the claimed “active region.” Opp. at 17. Indeed, the FAC itself alleges ***“there are no active regions”*** in that portion of the image sensor. Dkt. 38-12, Ex. D-3 at 2.

Unlike for other accused products, Greenthread did not annotate this graph either in the FAC or in its response (e.g., by circling the relevant portion) to identify the purported “active region” containing a “graded dopant concentration.” *Compare* Dkt. 38-12, Ex. D-1 at 11-12, and Opp. at 7-8, 16-17, *with*, Dkt. 38-10, Ex. B-1 at 9-10. Dell respectfully submits that if there were such an “active region,” Greenthread would have circled it.

Instead, Greenthread alleges a new theory of infringement in its response brief based on two cited SCM/SMIM images. That is, Greenthread states these images show “vertical grading between points 1 and 2” and, for the first time, “lateral grading between . . . the pixels,” both of which “are near the top of the SCM and SMIM images [the right edge of the SIMS graph], where the transistors in Dell’s device exist” (Opp. at 7, 17):

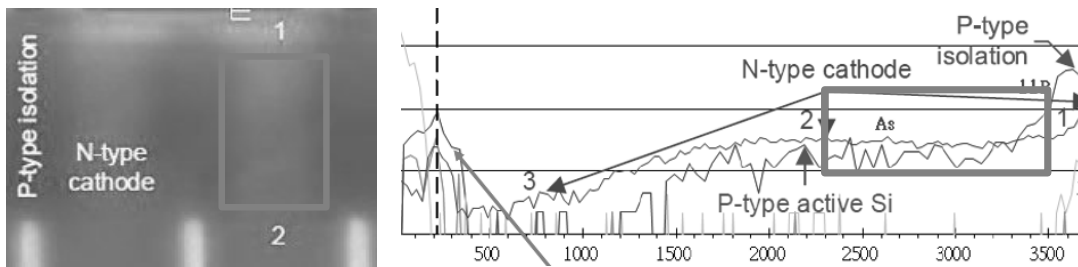


Even if these allegations were found in the FAC (they are not), they would not meet the pleading standard because they are “inconsistent” with Greenthread’s other pleadings and “contradict infringement.” *See Bot M8 LLC v. Sony Corp. of Am.*, 4 F.4th 1342, 1354 (Fed. Cir. 2021).

First, Greenthread’s allegations of graded doping in the region “between points 1 and 2” that is “*near*” the top surface “where the transistors . . . exist” (Opp. at 17) cannot plausibly allege infringement of the claim terms requiring that grading to be *inside (not near)* the “active region . . . within which transistors can be formed.” Dkt. 38-12, Ex. D-1 at 7, 9, 10-12. The area between points “1” and “2” encompasses the sub-surface photodiode region of the pixel, a region where Greenthread stated during prosecution that *no* transistors could be formed, contravening the requirements of every asserted claim. *See* Br. at 17-19. Greenthread admits that the portion of the same sub-surface photodiode region between points “2” and “3” is one where “*there are no active regions,*” and provides no explanation or other basis for concluding that the portion between the points “1” and “2” is any different in this respect. *See* Dkt. 38-12, Ex. D-3 at 2.

Second, Greenthread’s new allegations are also inconsistent with its allegations for the claim terms requiring the “active region” to be “*adjacent*” to the “substrate of a first doping type at a first doping level.” Dkt. 38-12, Ex. D-1 at 2, 7. The region between the points “1” and “2” at the right of the SIMS graph above is at the *far opposite end* of the device from the identified “substrate of a first doping type at a first doping level” at the left edge of the graph. *Id.*

Third, there is no “active region” containing “vertical grading between points 1 and 2.” See Opp. at 7, 17. The claims require an “active region” having a “doping type *opposite in conductivity*” to the claimed “substrate,” which is alleged to be “p-type.” Dkt. 38-12 at 2, 7. Thus, the “active region” of the pixels must have “n-type” doping, which is labeled “N-type cathode” in the SCM/SMIM images and SIMS graph (purple plot). In contrast to other portions of the sensor where doping levels appear to change, the doping concentrations in the “N-type cathode” shown between the points “1” and “2” are consistent and not graded (Dkt. 38-12, Ex. D-1 at 10-12):



Finally, Greenthread argues that there is “lateral grading” between the “N-type cathode” and the “P-type isolation” regions separating the pixels. Opp. at 7, 17. That theory, however, appears nowhere in either the FAC or its Infringement Contentions, which rely exclusively on “differences in carrier concentration as a function of depth” to show a “graded dopant concentration to aid carrier movement” in the required direction (top-to-bottom). *Id.* at 7 (quoting *id.*, Ex. 3 at 10); Dkt. 38-12, Ex. D-1 at 11-12. Greenthread provides no explanation of how **horizontal grading** could possibly “aid carrier movement” **vertically** from the first (top) surface to the second (bottom) surface, as it alleges in the FAC. Opp. at 17. In other words, Greenthread’s suggestion—found nowhere in the FAC— that “lateral” grading infringes underscores that it has failed to plead *any facts sufficient to infer that the identified graded dopant concentrations “aid carrier movement” in the specific directions required by the patents.*

III. Conclusion

For the reasons described above, Greenthread’s FAC fails to state a claim for relief.

Dated: July 25, 2022

Respectfully submitted,

/s/ Michael J. Newton

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*Attorneys for Defendants Dell Inc. and Dell
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CERTIFICATE OF SERVICE

I hereby certify that all counsel of record are being served with a copy of the foregoing document via the Court's CM/ECF system on July 25, 2022.

/s/ Michael J. Newton
Michael J. Newton

**UNITED STATES DISTRICT COURT
FOR THE WESTERN DISTRICT OF TEXAS
WACO DIVISION**

GREENTHREAD, LLC,

Plaintiff,

v.

INTEL CORPORATION, DELL INC., AND DELL
TECHNOLOGIES INC.

Defendants.

Case No. 6:22-cv-105-ADA

JURY TRIAL DEMANDED

**DECLARATION OF BRADY COX IN SUPPORT OF DELL'S REPLY IN SUPPORT OF
ITS MOTION TO DISMISS GREENTHREAD'S FIRST AMENDED COMPLAINT FOR
FAILURE TO STATE A CLAIM FOR RELIEF**

I, Brady Cox, hereby declare as follows:

1. I am an attorney with Alston & Bird LLP and a member of the Texas state bar. I represent Defendants Dell Inc. and Dell Technologies Inc. ("Dell") in the above-captioned case.

2. I submit this declaration in support of Dell's Reply in Support of its Motion to Dismiss Greenthread's First Amended Complaint for Failure to State a Claim for Relief. I make this Declaration of my own personal knowledge, and I could and would testify competently thereto if called as a witness.

3. Attached hereto as Exhibit 1 is a true and correct copy of the 8/11/2021 Notice of Allowance and Fee(s) Due in the file history for U.S. Patent Application No. 16/947,294 (issued as U.S. Patent No. 11,121,222), which includes highlighting added by counsel.

Executed this 25th day of July, 2022.

/s/ Brady Cox

Brady Cox

CERTIFICATE OF SERVICE

I hereby certify that all counsel of record are being served with a copy of the foregoing document via the Court's CM/ECF system on July 25, 2022.

/s/ Brady Cox

Brady Cox

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EXHIBIT 1



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
 United States Patent and Trademark Office
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NOTICE OF ALLOWANCE AND FEE(S) DUE

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 DALLAS, TX 75380

EXAMINER

ARORA, AJAY

ART UNIT

PAPER NUMBER

2892

DATE MAILED: 08/11/2021

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/947,294	07/27/2020	G.R. Mohan Rao	GRTD60-35294	6907

TITLE OF INVENTION: SEMICONDUCTOR DEVICES WITH GRADED DOPANT REGIONS

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	\$1200	\$0.00	\$0.00	\$1200	11/12/2021

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

HOW TO REPLY TO THIS NOTICE:

I. Review the ENTITY STATUS shown above. If the ENTITY STATUS is shown as SMALL or MICRO, verify whether entitlement to that entity status still applies.

If the ENTITY STATUS is the same as shown above, pay the TOTAL FEE(S) DUE shown above.

If the ENTITY STATUS is changed from that shown above, on PART B - FEE(S) TRANSMITTAL, complete section number 5 titled "Change in Entity Status (from status indicated above)".

For purposes of this notice, small entity fees are 1/2 the amount of undiscounted fees, and micro entity fees are 1/2 the amount of small entity fees.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed and an extra copy of the form should be submitted. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Maintenance fees are due in utility patents issuing on applications filed on or after Dec. 12, 1980. It is patentee's responsibility to ensure timely payment of maintenance fees when due. More information is available at www.uspto.gov/PatentMaintenanceFees.

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), by mail or fax, or via EFS-Web.

By mail, send to: Mail Stop ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

By fax, send to: (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

25883 7590 08/11/2021
MUNCK WILSON MANDALA L.L.P.
P.O. Drawer 800889
DALLAS, TX 75380

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being transmitted to the USPTO via EFS-Web or by facsimile to (571) 273-2885, on the date below.

(Typed or printed name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/947,294	07/27/2020	G.R. Mohan Rao	GRTD60-35294	6907

TITLE OF INVENTION: SEMICONDUCTOR DEVICES WITH GRADED DOPANT REGIONS

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	\$1200	\$0.00	\$0.00	\$1200	11/12/2021

EXAMINER	ART UNIT	CLASS-SUBCLASS
ARORA, AJAY	2892	257-025000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

☐ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.

☐ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-09 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list

(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,

(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1 _____
2 _____
3 _____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document must have been previously recorded, or filed for recordation, as set forth in 37 CFR 3.11 and 37 CFR 3.81(a). Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE

(B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent): ☐ Individual ☐ Corporation or other private group entity ☐ Government

4a. Fees submitted: ☐ Issue Fee ☐ Publication Fee (if required) ☐ Advance Order - # of Copies _____

4b. Method of Payment: (Please first reapply any previously paid fee shown above)

☐ Electronic Payment via EFS-Web ☐ Enclosed check ☐ Non-electronic payment by credit card (Attach form PTO-2038)

☐ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment to Deposit Account No. _____

5. Change in Entity Status (from status indicated above)

☐ Applicant certifying micro entity status. See 37 CFR 1.29

☐ Applicant asserting small entity status. See 37 CFR 1.27

☐ Applicant changing to regular undiscounted fee status.

NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.

NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.

NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature _____

Date _____

Typed or printed name _____

Registration No. _____



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
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 Alexandria, Virginia 22313-1450
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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/947,294	07/27/2020	G.R. Mohan Rao	GRTD60-35294	6907
25883	7590	08/11/2021	EXAMINER	
MUNCK WILSON MANDALA L.L.P.			ARORA, AJAY	
P.O. Drawer 800889			ART UNIT	
DALLAS, TX 75380			PAPER NUMBER	
			2892	
DATE MAILED: 08/11/2021				

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
 (Applications filed on or after May 29, 2000)

The Office has discontinued providing a Patent Term Adjustment (PTA) calculation with the Notice of Allowance.

Section 1(h)(2) of the AIA Technical Corrections Act amended 35 U.S.C. 154(b)(3)(B)(i) to eliminate the requirement that the Office provide a patent term adjustment determination with the notice of allowance. See Revisions to Patent Term Adjustment, 78 Fed. Reg. 19416, 19417 (Apr. 1, 2013). Therefore, the Office is no longer providing an initial patent term adjustment determination with the notice of allowance. The Office will continue to provide a patent term adjustment determination with the Issue Notification Letter that is mailed to applicant approximately three weeks prior to the issue date of the patent, and will include the patent term adjustment on the patent. Any request for reconsideration of the patent term adjustment determination (or reinstatement of patent term adjustment) should follow the process outlined in 37 CFR 1.705.

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

OMB Clearance and PRA Burden Statement for PTOL-85 Part B

The Paperwork Reduction Act (PRA) of 1995 requires Federal agencies to obtain Office of Management and Budget approval before requesting most types of information from the public. When OMB approves an agency request to collect information from the public, OMB (i) provides a valid OMB Control Number and expiration date for the agency to display on the instrument that will be used to collect the information and (ii) requires the agency to inform the public about the OMB Control Number's legal significance in accordance with 5 CFR 1320.5(b).

The information collected by PTOL-85 Part B is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 30 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. **DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450.** Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b) (2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

<i>Notice of Allowability</i>	Application No. 16/947,294	Applicant(s) Rao, G.R. Mohan	
	Examiner AJAY ARORA	Art Unit 2892	AIA (FITF) Status No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to 7/27/2020.
☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

3. ☒ The allowed claim(s) is/are 1-44. As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.

4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

a) ☐ All b) ☐ Some* c) ☐ None of the:

1. ☐ Certified copies of the priority documents have been received.

2. ☐ Certified copies of the priority documents have been received in Application No. _____.

3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

* Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)	5. <input type="checkbox"/> Examiner's Amendment/Comment
2. <input checked="" type="checkbox"/> Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date <u>9/29/2020 & 6/30/2021</u> .	6. <input checked="" type="checkbox"/> Examiner's Statement of Reasons for Allowance
3. <input type="checkbox"/> Examiner's Comment Regarding Requirement for Deposit of Biological Material _____.	7. <input type="checkbox"/> Other _____.
4. <input type="checkbox"/> Interview Summary (PTO-413), Paper No./Mail Date. _____.	

/AJAY ARORA/ Primary Examiner, Art Unit 2892	
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DETAILED ACTION

Notice of Pre-AIA or AIA Status

1. The present application is being examined under the pre-AIA first to invent provisions.

Reasons for Allowance

2. Claims 1-44 are allowed. The following is an examiner's statement of reasons for allowance:

Claims 1-20 are allowed because the prior art of record does not teach or suggest, singularly or in combination, at least the limitations of the base claim 1 that requires "at least one well region adjacent to the first or second active region containing at least one graded dopant region, the graded dopant region to aid carrier movement from the surface towards the area of the substrate where there are no active regions" (see last 5 lines).

The closest reference is Hong (US 2007/0045682), hereinafter Hong. More specifically, regarding claim 17, Hong (refer to Figures 4A-4D and 5A-5C) teaches a semiconductor device, comprising:

a substrate (312 – see para 29) of a first doping type (i.e. parts 312 and 21 of the substrate have n-type doping, see para 29) at a first doping level having a surface;

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a first region (311, which includes wells such as 21, 22, 5, 2) disposed adjacent the first surface,

a second active region (such as source/drain region 2, see para 40; or 2 or 5 or 22 of pixel cell formed in an adjacent region separated by shallow trench isolation 37 – see para 30) separate from the first region disposed adjacent to the first active region and within which transistors (406, 407) may be formed;

at least a portion of at least one of the first and second regions having at least one graded dopant concentration (350 – see para 24, last 3 sentences; also see Figure 5C and para 29) to aid carrier movement (para 26).

However, the first region is not an “active” region and the structure does not show that the graded dopant region is to “aid carrier movement from the surface to the area of the substrate where there are no active regions”. Further, it is not obvious to modify Hong as changing first region and second region as above would change the intended function of the device.

Similarly, claims 21-38 are allowed because the prior art of record does not teach or suggest, singularly or in combination, at least the limitations of base claim 21 that requires “at least one well region adjacent to the first or second active region containing at least one graded dopant region, the graded dopant region to aid carrier movement from the surface to the area of the substrate where there are no active regions” (see last 5 lines). Again, the closest reference is Hong.

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Similarly, claims 39-40 are allowed because the prior art of record does not teach or suggest, singularly or in combination, at least the limitations of base claim 30 that requires “at least a portion of at least one of the first and second active regions having at least one graded dopant concentration to aid carrier movement from the first or second active region to at least one substrate area where there is no active region” (see last 3 lines). Again, the closest reference is Hong.

Similarly, claim 41 is allowed because the prior art of record does not teach or suggest, singularly or in combination, at least the limitations of “at least one graded dopant acceptor concentration to aid carrier movement from the first or second active region to at least one substrate area where there is no active region” (see last 3 lines). Again, the closest reference is Hong.

Similarly, claim 42 is allowed because the prior art of record does not teach or suggest, singularly or in combination, at least the limitations of “at least one graded donor dopant concentration to aid carrier movement from the first or second active region to at least one substrate area where there is no active region” (see last 3 lines). Again, the closest reference is Hong.

Similarly, claim 43 is allowed because the prior art of record does not teach or suggest, singularly or in combination, at least the limitations of “at least one graded acceptor dopant concentration and one graded donor dopant concentration to aid carrier movement from the first or second active region to at least one substrate area where there is no active region” (see last 3 lines). Again, the closest reference is Hong.

Similarly, claim 44 is allowed because the prior art of record does not teach or suggest, singularly or in combination, at least the limitations of “a second static

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unidirectional electric drift field to aid the movement of carriers from the surface layer to the area of the substrate where there are no active regions” (see last 3 lines). Again, the closest reference is Hong.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled “Comments on Statement of Reasons for Allowance.”

Conclusion

3. Any inquiry concerning this communication or earlier communications from the examiner should be directed to AJAY ARORA whose telephone number is (571)272-8347. The examiner can normally be reached on 9 AM - 5 PM.

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at <http://www.uspto.gov/interviewpractice>.

If attempts to reach the examiner by telephone are unsuccessful, the examiner’s supervisor, Thao X. Le can be reached on 5712721708. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <https://ppair->

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my.uspto.gov/pair/PrivatePair. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/AJAY ARORA/
Primary Examiner, Art Unit 2892